If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

3.15 Response to Low Oxygen Alarm in RHIC or g-2 ODH Class 0 and 1 Areas

Text Pages 2 through 7

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: ***Signature on File*** _____
Collider-Accelerator Department Chairman — Date

A. Etkin

3.15 Response to Low Oxygen Alarm in RHIC or g-2 ODH Class 0 and 1 Areas

1. Purpose

To specify the initial response to a low oxygen alarm and to permit safe entry into ODH Class 0 and 1 areas following an alarm at RHIC or g-2 facilities (Tandem Van deGraff responds to ODH alarms in accordance with TVDG OPM 10017). If only one division of the PASS system alarms at a given location, use OPM 3.15.1.

The following ODH areas exist at C-A facilities:

ODH Area	ODH Class	Main Hazard
Collider Tunnel	0 (when gas < 50K)	Helium
Building 1002A	0 (when gas < 50K)	Helium
Building 1004B	0 (when gas < 50K)	Helium
Building 1006B	0 (when gas < 50K)	Helium
Building 1008B	0 (when gas < 50K)	Helium
Building 1010A	0 (when gas < 50K)	Helium
Building 1012A	0 (when gas < 50K)	Helium
Building 1005R	0 (when gas < 50K) 1 (when liquid in pots)	Helium
Building 1005H	0 (when gas < 50K)	Helium
Building 919 (g-2) 919 Compressor Room 919G Refrigerator Room 919 High Bay	 0 (when operating) 1 (when operating) 0 (when operating)	 Helium Helium Helium
Tandem (901A) MP-6 and MP7 Pits Mech. Equip. Room Elec. Equip. Room Build. Equip. Room	 0 0 0 0	 Sulfur Hexafluoride Sulfur Hexafluoride Sulfur Hexafluoride Sulfur Hexafluoride

2. Responsibilities

2.1. The responsibilities for the installation and maintenance of the Oxygen Monitor Systems is as follows:
   a) Access Controls Group – PASS
   b) Tandem Operations Group – Building 901A
   c) Facilities & Experimental Support Division – Building 919 (g-2)

2.2. The Main Control Room Operation Coordinator is responsible for supervising the execution of this procedure if the alarm is in a RHIC or g-2 area that is cleared for beam.

2.3 The Cryogenic Section Shift Supervisor is responsible for supervising the execution of this procedure at the Cryogenic Complex of RHIC and Building 919 (g-2).

2.4 The Tandem Shift Leader is responsible for responding to ODH alarms in accordance with TVDG OPM 10017, Oxygen Deficiency Hazard (ODH) Response. If the Tandem is operating with only one operator, the MCR shall assist in carrying out TVDG OPM 10017.

2.4.1 Tandem ODH alarms are received via "pump room" alarm communicator at MCR_1. If MCR receives this alarm, immediately contact Tandem. If you cannot contact Tandem, the Operations Coordinator, or designee, shall go to the Tandem.

3. Prerequisites

3.1 Tunnel or building entrants shall carry a personal oxygen monitor (POM) and a Self-Rescue Supplied Atmosphere Respirator (SRSAR), when entering an enclosure during the period where an ODH alarm remains un-verified. . The Cryogenic Section provides POMs and SRSARs for RHIC and g-2 entrants.

3.2 Before entering the ODH area that is alarming, personnel shall test the operation of their Personal Oxygen Monitor (POM) and verify the readiness of their Self-Rescue Supplied Atmosphere Respirators (SRSARs).

3.3 The POM shall be calibrated using fresh air and tested for alarm function. It shall be used to test the air at head level ahead of the personnel entering.

3.4 Anyone required to use a POM and SRSAR shall be ODH Class 1 qualified by completing TQ-ODH1, Oxygen Deficiency Hazard - Class 1, and AD-ODH-1-TRG, Oxygen Deficiency Hazard - 1 Practical.

4. Precautions

4.1 An ODH condition shall be assumed to exist if any area oxygen monitor or more than one POM alarms

> **Note:**
> Response to Single PASS Division ODH alarms is given in C-A OPM 3.15.1.

4.2 At RHIC and g-2, the hazardous oxygen-displacing gas is helium, which is lighter than ambient air at > 40K. At Tandem, the oxygen displacing gas is sulfur hexafluoride, which is always heavier than ambient air. The helium will rise as it warms and the sulfur hexafluoride will fall to the lowest levels in the area.

4.3 Great care and diligence must be exercised in the use of this procedure for reentry to prevent endangering personnel.

5. Procedure

Note:
The procedure for response to oxygen alarms at Building 901A (Tandem) is found in TVDG OPM 10017. If necessary, the MCR can access the Tandem Public Address system by dialing 3456 0798 and stating their message.

Caution:
If tunnel or building entrants POM indicates < 19.5% oxygen, immediately evacuate the area to an outdoor location.

5.1 Alarm Response.

Caution:
If it will take longer than one minute to assist, or if someone is unaccounted for, evacuate the alarming area immediately.

Notes:
1. ODH fans will run for at least 90 seconds following an ODH alarm in the area covered by the fans even if the alarm resets during the 90-second interval.
2. If the ODH alarm clears, the fans will automatically stop at the end of the 90-

5.1.1 For ODH 0 areas, upon activation of an area low oxygen monitor alarm, all personnel shall evacuate the area immediately. Check the area to see if anyone is trapped as you leave. If immediate help cannot be rendered, evacuate and call 2222 or 911 or activate a fire alarm for immediate assistance.

5.1.2 For ODH 1 areas, upon activation of an area low oxygen monitor alarm, or alarms on multiple POMs, all personnel shall don their SRSAR and evacuate the area. If someone is trapped, ensure the victim donned their SRSAR and evacuate. Call 2222 or 911, or activate a fire alarm for immediate assistance. If a single POM alarms, inform area personnel of the alarm, and leave the area to check the POM operation, or get a replacement unit.

5.1.3 After evacuating, call the MCR (4662) to explain the status of the emergency. Ensure that the Cryogenic Group Shift Supervisor is also informed (Control Room x3837 or x5308). If there is any injury, or personnel rescue required, wait for the Fire/Rescue group to arrive.

5.2 Accountability

5.2.1 If the low oxygen alarm is in the RHIC tunnel on Controlled Access, the Main Control Room Operations Coordinator (OC) shall ascertain if all personnel have exited the area.

5.2.2 If the low oxygen alarm is in any building other than the RHIC tunnel, or occurs while the RHIC tunnel is on Restricted Access, the supervisor for workers in the area is responsible to determine if all workers have exited the area.

5.2.3 If personnel are unaccounted for or injured, the OC or supervisor shall contact Emergency Services using 2222 or 911.

5.3 Entry and Re-entry into ODH area following an alarm.

5.3.1 If the source of the cryogen leak can be located, then the flow should be stopped, if possible, from the RHIC or g-2 Cryogenic Control Room.

5.3.2 If the cryogen leak can not be located from the Cryogenic Control Room, then the Cryogenic Group Supervisor (or designee) shall attempt to locate the leak from outside the building by looking through an open doorway to the area. If the leak can be located in this manner, attempt to stop the flow from outside the building.

5.3.3 If further action can only be made by entering the area, use the following guidance. The OC or supervisor of the work should determine the required emergency actions based upon this guidance and the particular conditions for the actual emergency.

a) Before entering the area, entering personnel shall test the operation of their personal oxygen monitors (POM) and verify the readiness of their Self-Rescue Supplied Atmosphere Respirators (SRSARs). The POM shall be calibrated using fresh air and tested for alarm function. It shall be used to test the air at head level, held ahead of the personnel entering. Each person entering the area shall have a POM and an SRSAR.

b) An ODH-qualified person shall be stationed at the entrance of the area with an oxygen monitor and an SRSAR and shall maintain contact with all personnel searching for and repairing the leak (visually and/or by radio or 900Mhz telephone).

c) Prior to entry, the supervisor ensures the area exhaust fans are running. The supervisor evaluates the need for extra temporary ventilation to supply fresh air into the area. If oxygen levels on the POMs are less than 19.5%, all personnel shall immediately evacuate. The supervisor shall ventilate the area with fresh air for a minimum of 15 minutes before a second attempt at re-entry. If oxygen levels remain less than 19.5%, reentry will require specific work planning, including appropriate Personal Protective Equipment (PPE). The OC shall sign the work permit if MCR is manned. If MCR is not manned, the Cryo Shift Supervisor shall sign the work permit.

d) Personnel search the area for the leak while maintaining constant surveillance of oxygen content of the air with their POMs.

e) If personnel do not locate a leak and the detection system is in the alarm state, the supervisor notifies the MCR. The supervisor and the MCR Operations Coordinator initiate a work plan to determine further action.

f) If no leak is found and the oxygen alarms automatically reset, then personnel may resume normal operation, but only if the alarms are not again activated, and only with approval of the OC.

g) If personnel locate the leak and the flow can be stopped, run the exhaust fans for at least 15 minutes before personnel entry for repairs. If the cryogen or gas flow cannot be stopped, then run exhaust fans and set up a local fan to supply fresh air into the work area until the alarm clears.

h) Repair personnel shall maintain direct contact with personnel out of the affected area.

i) After personnel isolate and repair the leak and oxygen concentrations are above 20%, access to the area can be returned to normal. If the leak was in the RHIC tunnel, follow the additional steps in Section 5.4.

5.3.4 If the ODH condition was real, the Cryogenics Group Supervisor (or designee) shall record the actions taken in the control room log, and in a report (next business day) to the ES&H Coordinator, C-A ESH&Q Division Head, and the Cryogenics Section Head.

5.4 Restoration of the RHIC Tunnel to Restricted Access After a Release of Helium

5.4.1 If the ODH alarm occurred within the RHIC tunnel, verification that the vertical exits at the A and C alcoves are not filled with helium gas shall be made by CAS before changing the mode of the enclosure back to Restricted Access.

> **Warning**
> If an oxygen concentration less than 19.5% is found on the way up the ladder, do not proceed any farther. A suffocation hazard may be present at higher elevations. Contact a member of the C-A ES&H staff to plan the ventilation of the escape hatch using an enhanced work permit.

5.4.2 Verification shall be made using a portable oxygen monitor with an active pump. Proceed up the ladder slowly and monitor the air above head height.

6. Documentation

6.1 Cryogenic Control Room Logbook.

6.2 Report to the ES&H Coordinator, and ESHQ Division Head.

6.3 Report to the Cryogenics Section Head.

6.4 Enhanced Work Permits (if used).

7. References

7.1 SBMS Subject Area Oxygen Deficiency Hazards (ODH).

7.2 TVDG OPM 10017, Oxygen Deficiency Hazard (ODH) Response.

7.3 C-A OPM 3.15.1, "Response to Single PASS Division ODH Alarms".

8. Attachments

None